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Exercises in
Manual Training
FOR THE
Rural Schools

JNO. R. SLACKS
COUNTY SUPERINTENDENT
SAC COUNTY, IOWA

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Manual Training

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JNO. R. SLACKS
County Superintendent
SAC COUNTY, IOWA

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No. 1.

To the Teachers:

THE following lessons are planned especially for the pupils in the rural schools. It is needless for me to say anything about the lack of equipment for this work. We can only do the best we can under the circumstances and hope for the time when we will have the schools equipped for this work the same as for the work in geography.

The first few lessons are in cardboard construction. This is given for the purpose of giving the pupils training in accuracy and neatness. I hope you will insist on having the work done well. Inspect and measure the work submitted to you. If it is carelessly done and is not accurate, assign the same problem for the next week's work.

In the wood work it may not be possible to do the work at school. Try, however, to have the boys bring what tools they have to school on Friday and do as much work there as possible. One may be able to bring a plane, another a saw and square, another a hammer, etc. Many schools have a discarded desk out in the coal house. This may be brought in and used as a bench. Perhaps the boys may be so interested that they will make a bench.

Much of the material used may be picked up around any home. Ask the boys to keep goods boxes, packing cases etc. that may have good boards on them suitable for making the articles given in the lessons. If it is necessary for them to do the work at home, ask them to bring the completed article to school so you and the other pupils may see the degree of success attained.

Much depends on you for the success of this work. If you raise any money for tools, I would suggest that you get first the following:

Cross Cut Saw	Hammer
Jack Plane	Try Square
Block Plane	Ruler or Spuare

An exhibit of the work done in Manual Training and the girls' work in Domestic Science given at some time near the close of school would do much to create an interest on the part of the parents.

Encourage your pupils to make some article given in these lessons and send it to the county fair next year.

Supt. Geo. E. Wallace of Schaller has rendered excellent assistance in the preparation of these lessons by furnishing a number of the working drawings used.

It is hoped that this pamphlet will be of some help to you and your pupils.

Very truly,
JOHN R. SLACKS.
County Superintendent.

Sac City, Iowa, January, 1917.

TO THE PUPILS:

In doing the work outlined in the following lessons you need to bear in mind these few suggestions.

Before beginning work on any lesson read over carefully the printed directions for that lesson. Note the materials you will need. See that you have at hand the tools required. Study the working drawing carefully to see that you understand it clearly. When in doubt on any point consult your teacher.

The mark (") is a sign used to indicate the word "inches". Thus 2" is to be read "two inches". When you see an arrow head pointing each way from a number, the number gives the distance between the two arrow points or heads. For example, in Lesson I Fig. 1 each square is two inches on each side as indicated by the 2" and the arrow points. By noting these things carefully you will make few mistakes. Work with care and be sure to make all measurements accurately. By holding your ruler on edge you will bring the divisions of its scale closer to your paper or board and so be able to get more nearly exact measurements. One-thirty-second part of an inch is too large an error to make. When you complete the work of a lesson leave your model with your teacher to be tested for accuracy and inspected for neatness. Do your very best at all times.

I shall hope to see some of your work when I visit your school.

Very truly,
JOHN R. SLACKS.

LESSON I.

PLATE I. FIGURE 1. MODEL OF A CUBE.

MATERIAL—Cardboard at least 7in. by 9in. in size. Paste or mucilage.

TOOLS—Ruler, sharp lead pencil, knife or scissors.

WORK—With your ruler and pencil lay out the drawing for the model exactly as it is indicated in the drawing in Fig. 1. Make the squares 2in. on each side. Draw very light lines at first until you are sure you have it correct. You must have right angles or square corners in your squares If you do not have a T square for this, use a post card After you are sure your drawing is correct you may make the lines heavier, if you wish.

Cut out the cardboard on the outside lines of your drawing. Lay the edge of the ruler along the inside lines and score them with the knife being careful not to cut very deeply. Bend the cardboard up along all of these lines and you will find that you have the pattern for a cube or square box. Put paste on the flaps and place them in the proper position. Hold them until they stick in place firmly.

Try this model again making the squares 3in. or 4in. in size. This will, of course, require a larger sheet of paper. By leaving the top so it can be opened and closed you can make candy boxes, etc. in this way.

LESSON II.

PLATE I. FIGURE 2. HOLLOW CYLINDER.

MATERIAL—Cardboard 4in. by 6in., paste or mucilage.

TOOLS—Ruler, sharp lead pencil, knife or scissors.

WORK—Lay out the drawing given in Figure 2 according to instructions given in Lesson I. Do the work very carefully. Put paste on the flap and stick it in place along the other edge of the model. Try again on a larger scale. By using larger sheets of stiff cardboard mailing tubes of different sizes may be made in this way.

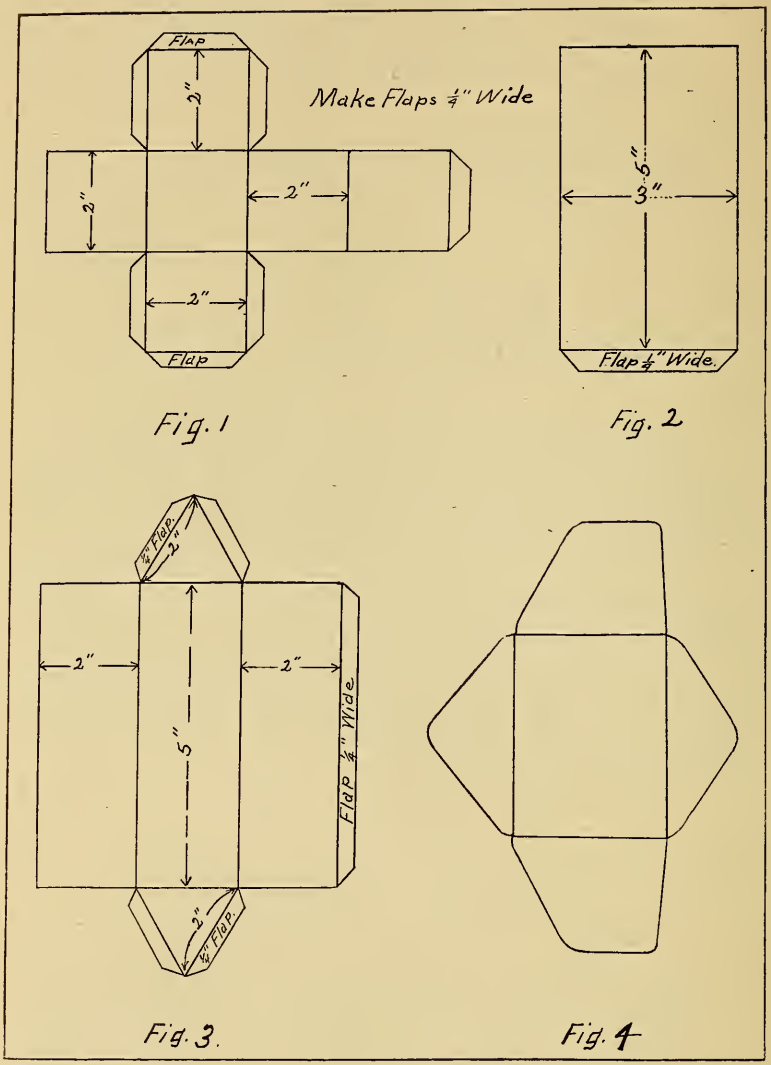

Flap
2"
Make Flaps ¼" Wide
2"
2"
2"
Flap
Fig. 1
5"
3"
Flap ¼" Wide.
Fig. 2
¼" Flap.
2"
2"
2"
5"
Flap ¼" Wide
2"
¼" Flap.
Fig. 3.
Fig. 4

PLATE I.

LESSON III.

PLATE I. FIGURE 3. TRIANGULAR PRISM.

MATERIAL—Cardboard sheet 7in. by 12in., paste or mucilage.

TOOLS—Ruler, pencil, knife or scissors.

WORK—Lay out the drawing as directed in the first lessons. Cut out all around the figure with the scissors. Score along the inside lines with the knife using the ruler to keep you straight. Be careful you do not cut through the paper. Bend along the scored lines and paste the flaps as directed in the first lessons. By making this figure larger and punching holes in the sides and leaving the top open a lantern may be made. Use a small candle for a light. A small nail or wire may be run up through the bottom on which to stick the candle. Or make a small open cylinder as in Lesson II, make cuts in one end after pasting, bend back the small sections and paste in the bottom to hold the candle.

LESSON IV.

PLATE I. FIGURE 4. ENVELOPE PATTERN.

MATERIAL—Good strong plain paper of any kind.

TOOLS—Ruler, scissors, pencil, knife.

WORK—No dimensions are given for this problem as each pupil will probably want to make a different size of envelope. Measure the drawing given so as to get your drawing of the right proportion. Make it two or three times larger than the drawing given. After cutting out your drawing score along inside lines and fold. Paste along the proper edges. You can tell these after you have folded the paper. Try other envelopes of large sizes.

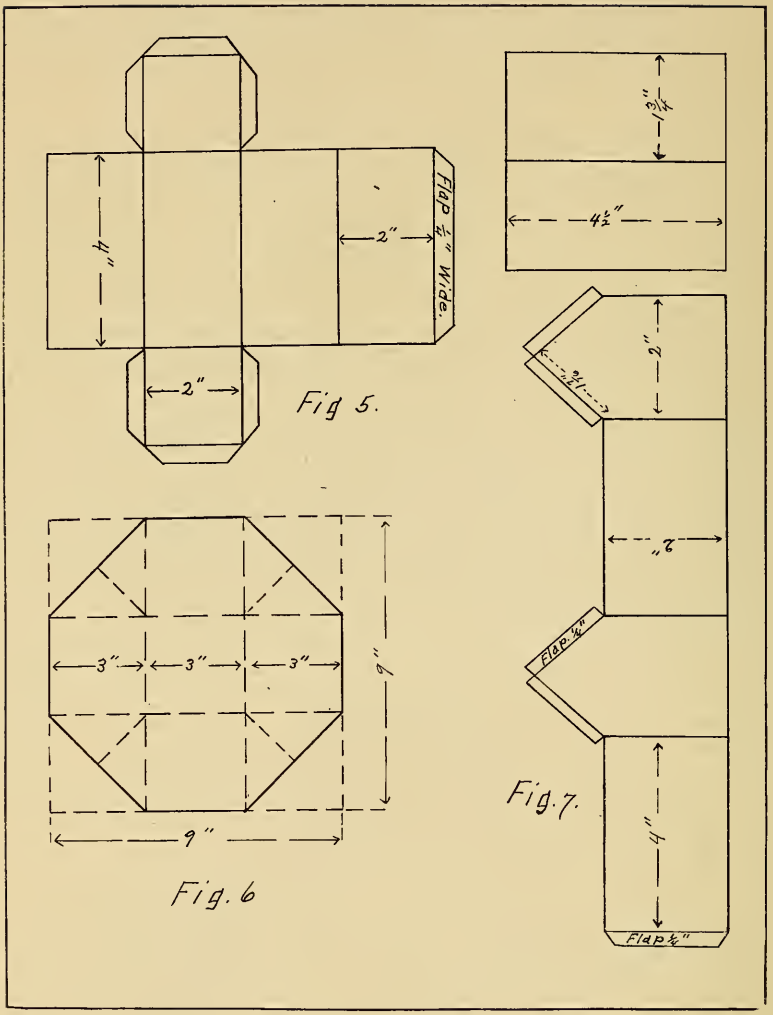


PLATE II.

LESSON V.

PLATE II. FIGURE 5. SQUARE PRISM.

MATERIAL—Cardboard 9in. by 9in., paste or mucilage.

TOOLS—Ruler, pencil, scissors, knife.

WORK—The directions for this lesson are the same as those for Lesson I. Do the work carefully and you will have good results. Crease the inside lines well before beginning to paste. By leaving the side flap unpasted you can make boxes for different purposes. Try others of different sizes. Also try this of thick pasteboard.

LESSON VI.

PLATE II. FIGURE 6. PATTERN FOR A BOX.

MATERIAL—Cardboard or other good strong paper 9in. by 9in., paste.

TOOLS—Ruler, pencil, scissors, knife.

WORK—Study the drawing in figure 6 carefully before you begin to work. First make a square 9in. on each side. Divide this into 3in. squares as shown by the dash lines in the drawing. Draw the heavy lines as shown in the drawing. Also draw the dash or dotted lines. Cut out along the heavy solid lines. This cuts off the corners of your paper and gives you an eight sided figure. Using ruler and knife score all dash lines except the dimension line made up of the arrows and figures. Crease and fold on all scored lines and you will have a box with an open top. By making another only slightly larger you can have a top for your box.

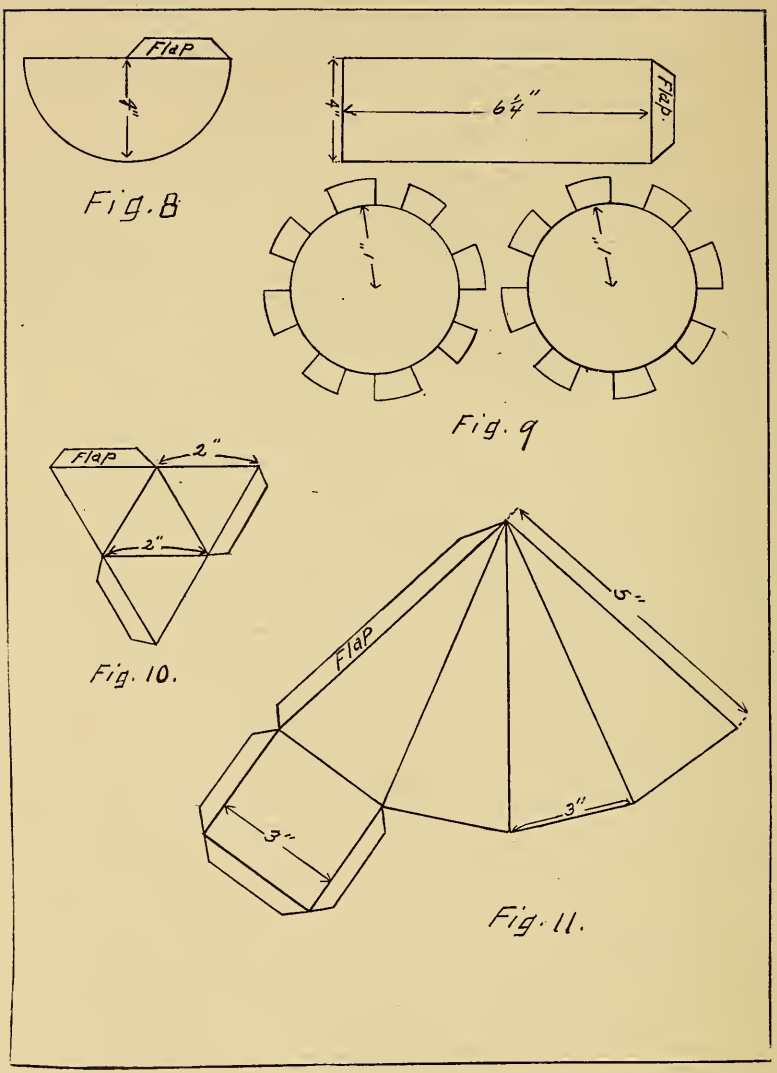


PLATE III.

LESSON VII.

PLATE II. FIGURE 7. PATTERN FOR A HOUSE.

MATERIAL—Cardboard 4in. by 13in. and a sheet 3½ in. by 4½in., paste.

TOOLS—Ruler, pencil, scissors, knife.

WORK—Lay out the drawing, making all measurements carefully. Cut out on outside lines. Crease and fold as directed in preceding lessons. Crease flaps into position for pasting on roof before applying paste. Crease roof on middle line and paste to the flaps on house leaving ½in. projection at each end.

LESSON VIII.

PLATE III. FIGURE 8. PATTERN FOR A CONE.

MATERIAL—Cardboard 6in. by 9in., paste or mucilage.

TOOLS—Ruler, pencil, knife, compass or dividers, scissors.

WORK—With your ruler and pencil draw a line along one side of your paper ½in. from the edge. Set the points of the compass 4in. apart. Place one point on the middle point of the line you have drawn and describe a semi-circle on the paper. Complete the drawing by drawing the flap as shown in the diagram ¼in. wide. Cut out carefully on the outside line. With ruler and knife score the line of the flap. Put paste on the flap, bend the paper and bring the flap over until the two edges meet perfectly. Hold in position until it sticks. Try again cutting off part of the circle so as to make a smaller base to the cone. Megaphones may be made in this way.

LESSON IX.

PLATE III. FIGURE 9. PATTERN FOR CYLINDER.

MATERIAL—Cardboard 4in. by 7in. and a sheet 3in. by 6in.

TOOLS—Same as in lesson VIII.

WORK—The first part of this lesson is the same as in Lesson II. For this use the sheet of cardboard 4in. by 7in. Set the points of the dividers 1in. apart as indicated in the diagram. Draw two circles at least ½in. apart on your other paper. Now set the dividers with the points 1¼in. apart and draw circles around the first ones drawn using the same centers. Cut out with the scissors or knife leaving the little flaps as shown in the diagram. Score and bend up the flaps so they will go inside the end of the cylinder you have made. Paste in position. By leaving one end off you can make cups, etc.

LESSON X.

PLATE III. FIGURE 10. TRIANGULAR PYRAMID.

MATERIAL—Cardboard 5in. by 5in., paste.

TOOLS—Ruler, pencil, knife or scissors.

WORK—Lay out the drawing as shown making the sides of each triangle 2in. in length. Flaps ¼in. in width. Cut out the figure, score inside lines, bend and paste. Try this again using larger paper and making the triangles 3in. in size.

LESSON XI.

PLATE III. FIGURE 11. SQUARE PYRAMID.

MATERIAL—Cardboard at least 9in. by 12in., paste.

TOOLS—Ruler, pencil, knife or scissors.

WORK.—Lay out the drawing as indicated. Cut out and paste. The long flap should be tapered considerably at the upper end or it will not fit inside when put together. You may find it necessary to cut off part of this in order to get a good fit. Look up about the Pyramids of Egypt.

LESSON XII.

PLATE IV. DOOR BUTTON.

MATERIAL—Piece of wood 5¼in. by 1½in. by ¾in.

TOOLS—Saw, plane, try square, pencil, knife, brace and small bit.

WORK—Saw out the block a little larger than the dimensions given in drawing and plane down to the proper size. Mark off with your pencil the rounded corners and the slant to be given to the two ends. Cut away the wood with your knife and finish with the plane on the top of the two ends. Saw off the corners and finish rounding them with your knife. Sandpaper the ends to get them smooth. Bore the hole (A) with a small bit.

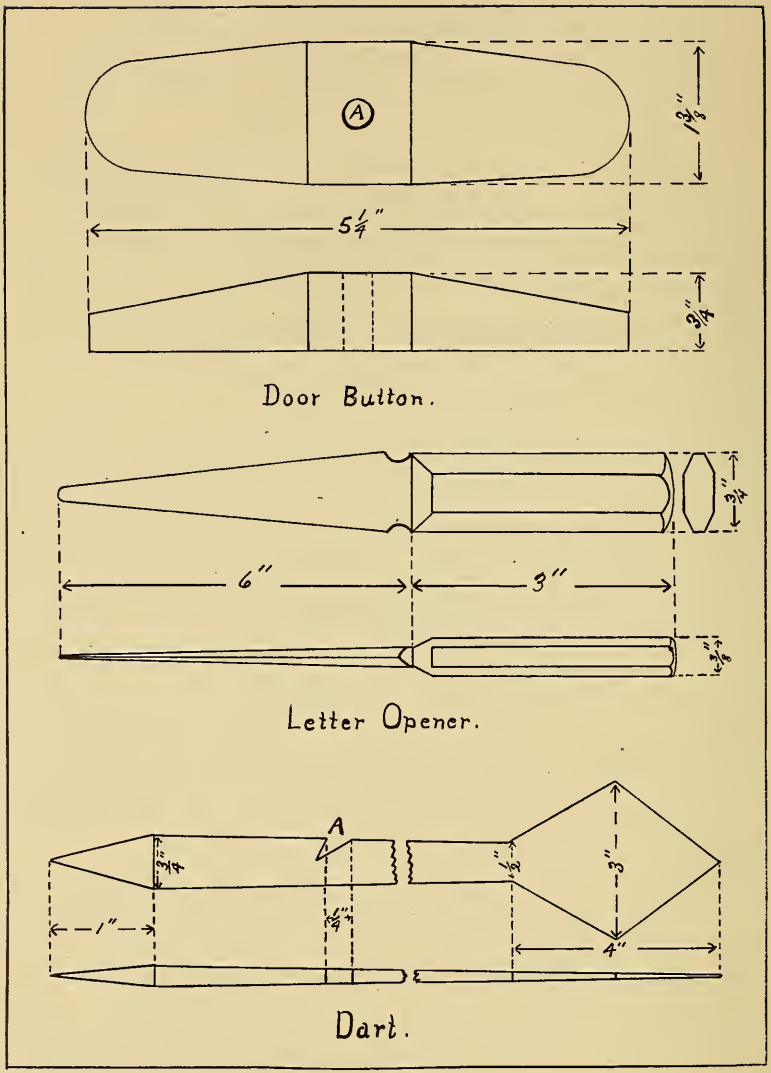


PLATE IV.

LESSON XIII.

PLATE IV. LETTER OPENER.

MATERIAL—Pine or other soft wood 10in. by 7/8in. by 1/2in.

TOOLS—Knife, plane, ruler, pencil.

WORK—Plane the wood down to the size and shape indicated for the handle. Measure off the proper length for the handle as given in the diagram. With the knife whittle down the blade to the proportion shown. Bevel off the edges. Sandpaper to make smooth. This may also be varnished. Try out of hard wood also.

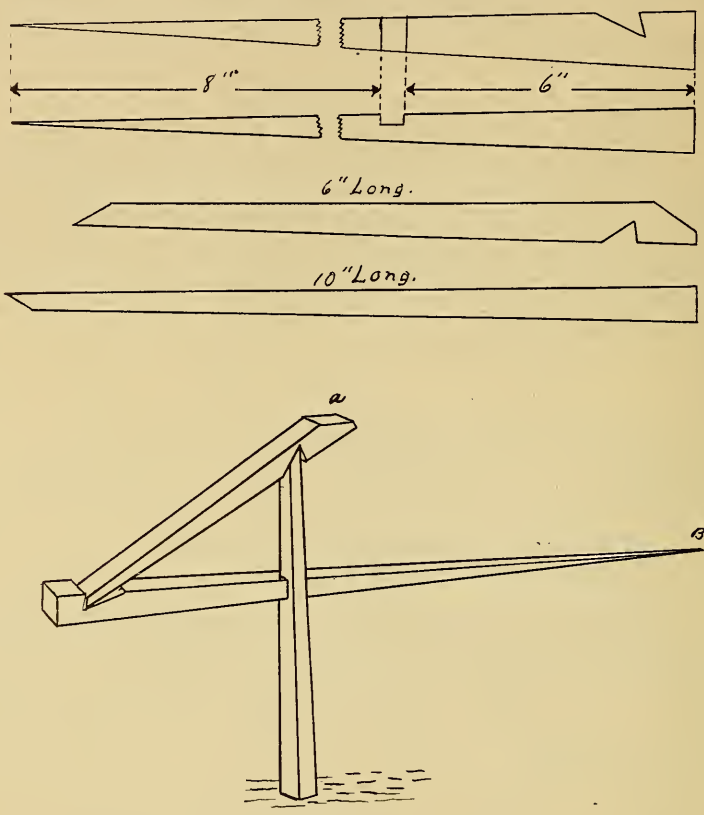
LESSON XIV.

PLATE IV. DART.

MATERIAL—Shingle at least 3in. wide.

TOOLS—Knife, ruler, pencil.

WORK—No length is given in this diagram as it is supposed to be made the same length as the shingle. The broken part in the drawing is to indicate that part of the length is left out at that point. With your ruler and pencil lay out the drawing of the dart with the wide end on the thin end of the shingle. With your knife cut out down to the lines you have drawn. To locate the notch (A) balance the dart on your knife blade and cut the notch at the point of balance. Most boys know how to shoot a dart. Use a rather stiff stick about two feet long. Tie a strong string to one end. The string should be about 18in. long. On the end of the string make a good sized knot or tie a short piece of stick about the size of a match. Hold the dart in the left hand holding the wide thin point between the thumb and finger. The end of the string with the knot should be placed in the notch. Hold the other end of the stick in the right hand. Stretch the string taut and by means of the stick throw the dart into the air. A little practice will enable you to shoot the dart to great heights.



Trigger for Rabbit Trap.

PLATE V.

LESSON XV.

PLATE V. TRIGGER FOR A RABBIT TRAP.

MATERIAL—Pine strip ½in. square and 30in. long.

TOOLS—Saw, plane, knife. May be made with knife alone.

WORK—If you are good at whittling, this will be an easy problem for you. Saw or cut the strip of pine into pieces 14in., 8in. and 6in., length. Whittle or plane down to the shape indicated. Whittle the notches in the two pieces as shown.

To set the trap arrange the trigger as shown in the drawing. Place a box over the trigger with the edge of the box resting on the top at point (A) and the sharp end (B) sticking under the box. Before setting trap stick a short piece of an ear of corn or other bait on the sharp stick.

LESSON XVI.

PLATE VI. NAIL AND SCREW TRAY.

MATERIAL—Either ½in. or 1in. stock may be used for this.

2 pieces 16in. by 3in., sides.
2 pieces 12in. by 3in., ends.
4 pieces 5¼in. by 3in., partitions.
1 piece 12in. by 16in., bottom.
1 piece 14in. by 5in., middle and handle.

TOOLS—Saw, plane, try square, ruler, brace and 1in. bit.

WORK—Saw out stock for the various pieces as shown in the drawing. Note size of the hole cut for the handle. Use the brace and bit for this work. Plane pieces to make perfect fit at all joints. Nail together carefully. Refer to the drawing often while doing the work.

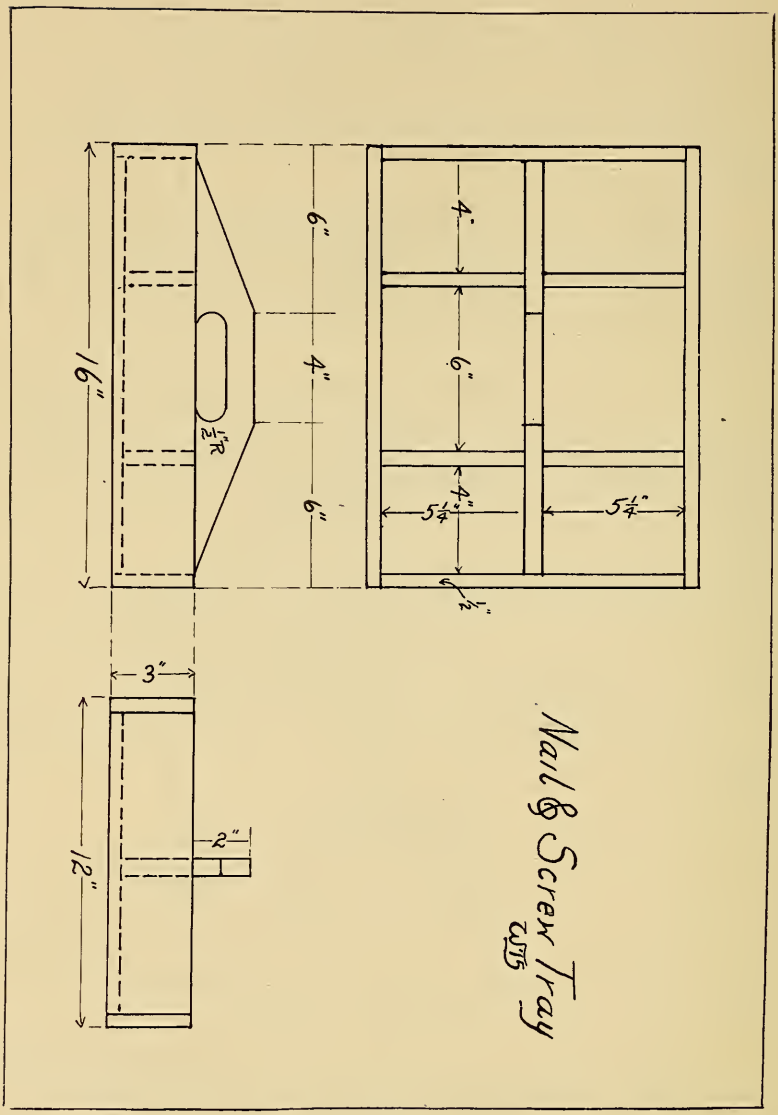


PLATE VI.

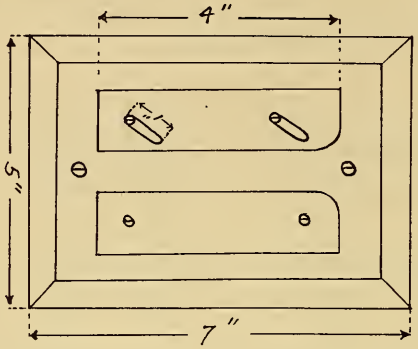
LESSON XVII.

PLATE VII. BROOM HOLDER.

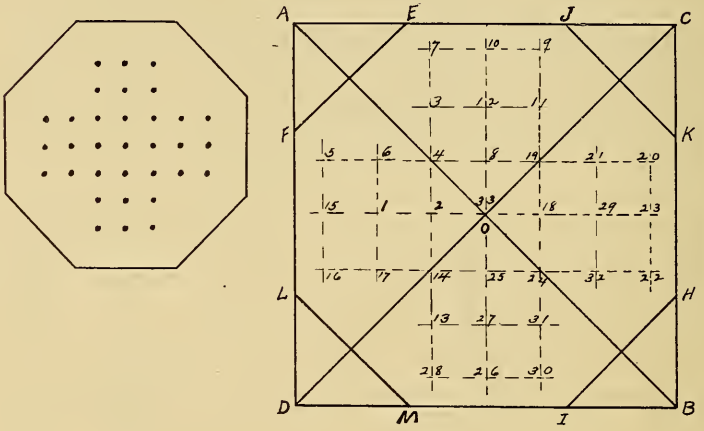
MATERIAL—Pine board 7½in. by 5½in. by ⅞in. thick. Two pieces 4in. by 1in. by 1½in. 4 1½in. screws with round heads. 2 1½in. flat head screws. 2 small washers.

TOOLS—Saw, plane, try square, brace and small bit, ruler, pencil, screw driver.

WORK—Cut out the board 5in. by 7in. in size as indicated by the drawing. Be sure to have square cuts at each end. Use the try square in squaring the ends of the board. Plane the edges until it is of the size desired. Bevel off the edges as shown in the drawing. Saw the two small blocks and plane them to the size indicated. Round off the two corners as shown. In one of them bore two small holes for the screws as shown. In the other block cut slots one inch long in the manner shown. To do this bore a small hole at each end of the slot then bore or cut out the wood between them. This slot should work smoothly on the round headed screws Fasten the blocks to the base board as shown in the larger drawing. Place the washers under the heads of the screws holding the slotted block. Do not force these two screws in too tightly. The block should be free to move up and down along the slots. With the flat headed screws fasten the base board to the wall where desired. Be sure the rounded corners of the blocks are downward. Push the broom handle upward between the blocks. The movable block should move easily on the screws in the slots. It will drop downward and inward and hold the broom in place.



BROOM HOLDER



GAME BOARD.

PLATE VII.

LESSON XVIII.

PLATE VII. GAME BOARD.

MATERIAL—A 7/8in. board 8in. square, 1/4in. wooden rod for pegs.

TOOLS—Ruler, square, pencil, brace and 1/4in. bit, plane, block plane.

WORK—Square up board and plane it exactly 8in. square. With ruler and pencil draw the diagonals of the square. These are the lines AB and CD in the diagram. Where these lines cross is the center of the square marked O in the diagram. Measure the distance from the center to a corner. Lay off this distance from each corner in both directions. This will give you the points marked EFHIKJLM. Connect these points across the corners as shown in drawing. Saw off these corners and you have an octagon. Remember how to do this for you will want to do the same thing again in another lesson. With light lines draw the dash lines as shown in the diagram 1in. apart. The points where these lines cross mark the positions of the holes. With the brace and bit bore holes at these points. Stop boring when the point of the bit appears on the back of the board. This will leave a thin part of the wood so the pegs will not drop through. If you prefer, you can bore entirely through and then put a thin board on the back of your board.

Cut pegs from the wooden rod 1 1/2in. in length. Thirty two pegs will be needed. Sandpaper and varnish your board.

THE GAME.

This game may be played by one or more persons. Place pegs in all the holes except the center hole. It is played by jumping the pegs over one another as in checkers and removing from the board the pegs jumped. One peg and only one may be jumped at a time. No peg may be moved except to jump another peg and in jumping it must not cross a vacant space nor be moved diagonally. One player plays until he can make no more jumps. Then count the pegs left on the board. Place the pegs in position again and let the next player try. The one having the least number of pegs left on the board wins. A person playing alone tries to jump all but one peg and to leave that one in the center hole.

Following is the key to the game for one person. The numbers refer to the numbers given on the diagram. For example, the first play 1-33 means to jump the peg from hole 1 over into hole 33 removing peg 2 which was jumped.

1-33	7-4	20-19	28-14
1-33	7-4	20-19	28-14
3-2	6-8	8-21	17-25
5-4	13-2	22-20	29-33
2-3	33-1	20-19	33-27
7-4	15-2	11-18	30-24
8-6	16-14	24-14	32-25
9-7	2-13	26-25	27-33
11-3	18-11	25-17	

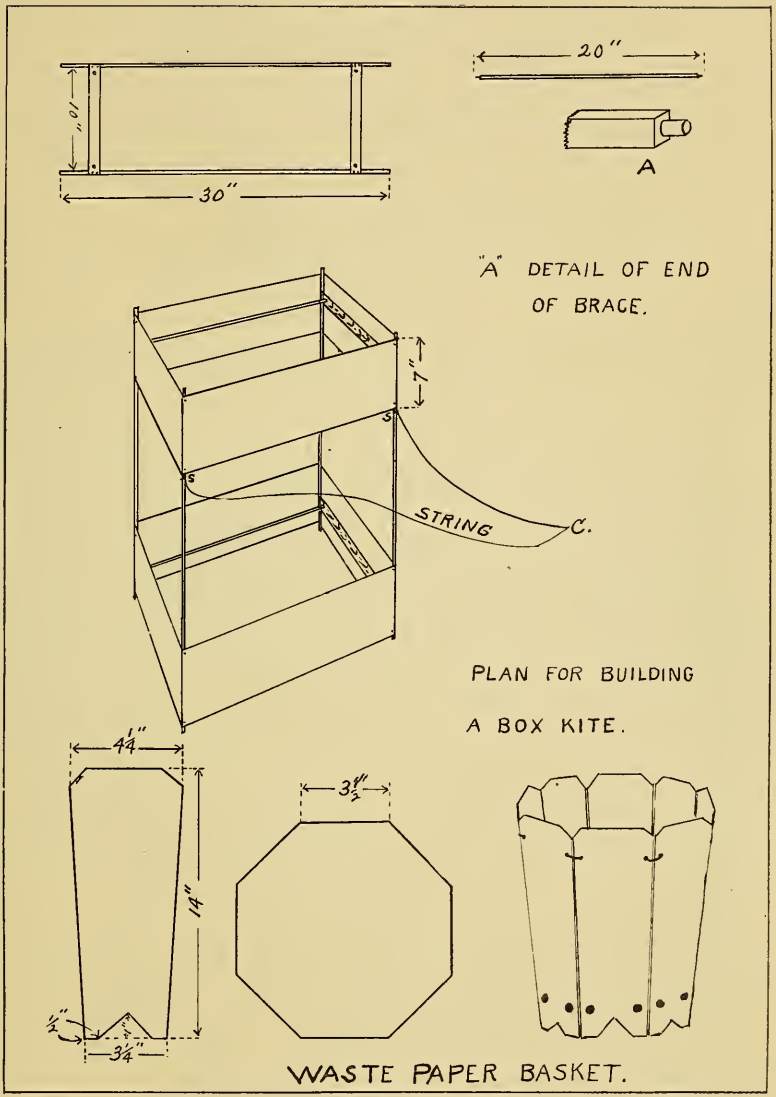

10"
30"
20"
A
"A" DETAIL OF END OF BRACE.
7"
STRING
C.
PLAN FOR BUILDING A BOX KITE.
4¼"
14"
½"
¾"
3¼"
3½"
WASTE PAPER BASKET.

PLATE VIII.

LESSON XIX

PLATE VIII. PLAN FOR A BOX KITE.

MATERIAL—Pine or other soft wood strips ¼ inch square as follows:

4 pieces 30in. in length.
4 pieces 20in. in length.
Strips ⅛in. thick and 1¼in. wide as follows:
4 pieces 10in. in length.
Muslin 7in. wide and 60in. long, 2 strips. Tacks, ½in. brads.

TOOLS—Ruler, knife, scissors, hammer, saw, brace and 3-16in. bit.

WORK—Cut off the 4 pieces 30in. in length. Lay down two of them and fasten on the two thin strips of wood as shown in the drawing at the top of Plate (VIII). Let these be 2in. from the ends of the long pieces. Use the brads in nailing these on and clinch the ends of the brads flat. Make the other side in the same manner using the other pieces and strips. With the brace and bit bore holes in the strips as shown in the drawing ¼in. in from the inside of the long piece. Bore all eight holes. Take the 20in. pieces and with your knife cut the ends as shown in the drawing at A. The small end part, a tenon, should be ¼in. in length. These tenons are to fit into the holes bored in the thin cross strips. Saw off the ends, if they project through too far. Tack on the muslin strips as shown in the diagram. This should be even and tight. Tie a strong string about six feet long at the points marked (s) and (s). At the center of this string, marked (C), tie your string for flying the kite.

To fly the kite, stand it up as shown in the diagram about fifty feet from you. Holding the end of the string run into the wind. Let out string as desired.

LESSON XX.

PLATE VIII. WASTE PAPER BASKET.

MATERIAL—Pine wood ½in. thick as follows:
8 pieces 5in. by 15in
⅞in. board 10in. square
16 round headed screws 1½in. long.
Leather shoestring.

TOOLS—Saw, plane, ruler, pencil, dividers, brace and ⅛in. bit.

WORK—Lay out the pattern of one of the sides as shown in the detail drawing at the left of the diagram. Plane it down to the exact size given. With this as a pattern lay out and make the other seven sides. With the brace and bit bore the holes as indicated in the diagram of the finished basket 1½in. from the bottom and ½in. from the sides or edges. The holes at the top should be 3in. from the top and ½in. from the edge of the piece.

On the ⅞in. board lay out the bottom according to the instructions given in Lesson XVIII. For this you will want to make your square exactly 8½in. on a side. Saw out the bottom. Fasten on the sides with the screws as shown in the diagram. Tie the sides together at the top with pieces of the leather shoestring. When finished the wood should be sandpapered and varnished or stained.

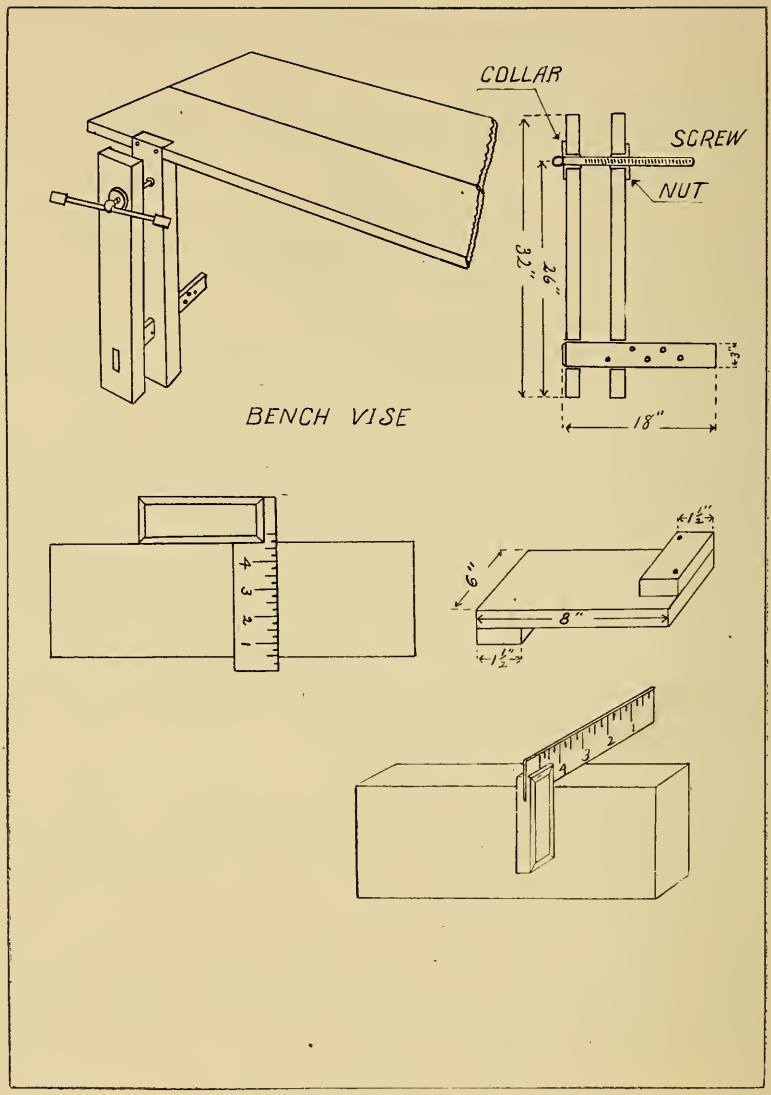


PLATE IX.

LESSON XXI.

PLATE IX. SUGGESTIONS FOR A BENCH VISE.

This suggestion is given here for those boys who may want to make a vise for their use at home or at school. The material may vary according to what may be available for use. The screw may be bought for about fifty cents. The bench may be made out of lumber that may be found round the farm home. The jaws of the vise should be made of material at least 2in. by 4in. The drawing is plain enough so no trouble should be experienced in making the bench. It will be found very useful in all the work that is to follow.

LESSON XXII

PLATE IX. BENCH HOOK.

MATERIAL—Board 6in. by 8in. Two pieces of same 1½in. by 5in. Screws.

TOOLS—Saw, plane, try square, brace and ⅛in. bit, screw driver.

WORK—The drawing for this is given in Plate (IX) at the right just under the detail drawing of the vise. Saw out and plane your stock to the size desired. Bore holes through the small pieces and fasten on with screws as shown. This will be found useful in holding small pieces for sawing, etc.

NOTE—The other two drawings in Plate (IX) are to illustrate the method of holding the try square in using it to square a board and to test your work in planing. The one at the left shows the method of squaring a board. The other at the bottom shows how to test your work. If you can see under the blade of the try square when held as shown, your work is not exactly square.

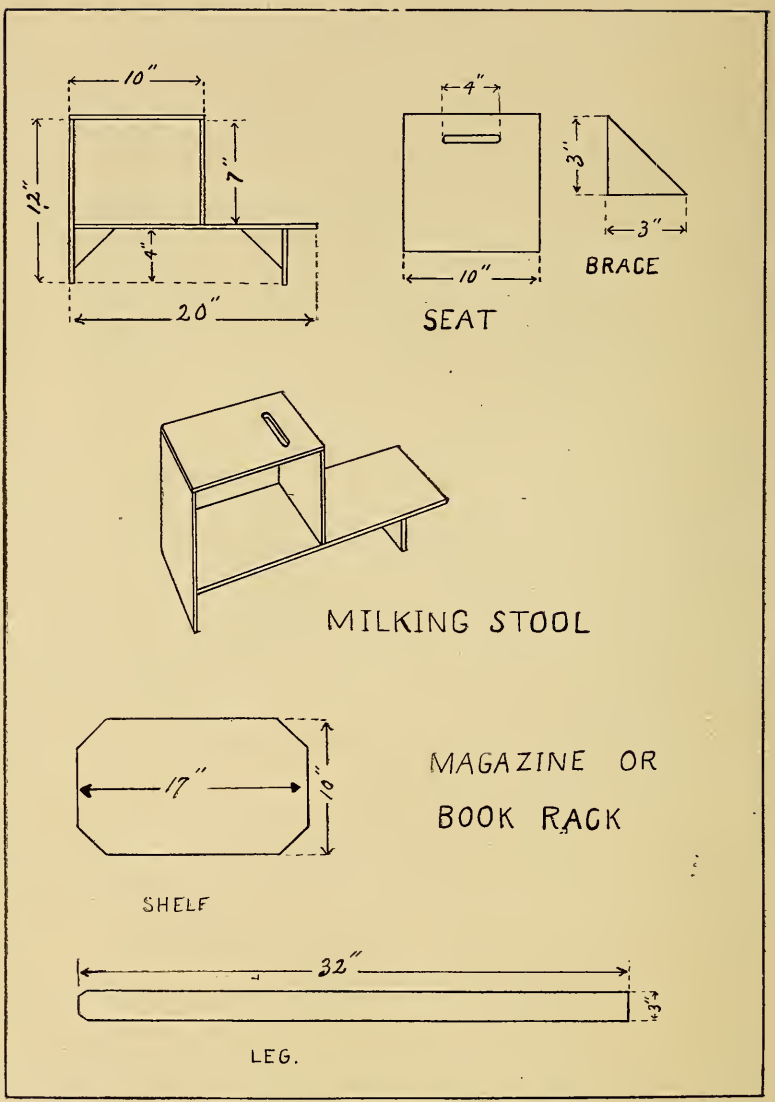

10"
12"
7"
4"
20"
4"
10"
SEAT
3"
3"
BRACE
MILKING STOOL
17"
10"
SHELF
MAGAZINE OR
BOOK RACK
32"
3"
LEG.

PLATE X.

LESSON XXIII.

PLATE X. MILKING STOOL.

MATERIAL—⅞in. board 10 inches wide and 58in. long. Nails.

TOOLS—Saw, square, hammer, pencil, brace and 1in. bit.

WORK—Saw out the pieces being careful to get each one square.

Saw one piece 20in. long, one 12in , one 10in., one 7in., one 4in. and one 3in. Nail these pieces as shown in the drawing being sure to get measurements accurate and everything square. Take the 3in. piece and saw it diagonally from one corner to the opposite one. These pieces are for the braces and should be nailed in as shown. With the brace and bit bore two holes 4in. apart and 2in. from the front edge of the seat or top. Bore or cut out between these holes. This makes a convenient handle with which to life the stool. The bucket is placed on the shelf on the front. Make one and try it and see how you like it.

LESSON XXIV.

PLATE X. MAGAZINE OR BOOK RACK.

MATERIAL—⅞in. board 54in. long. 4 pieces ⅞in. by 3in. by 32in. Nails.

TOOLS—Saw, plane, square, hammer, pencil.

WORK—Saw out the shelves 17in. long. Be sure to square each end. Measure back 2⅛in. from each corner of the shelves and place mark. Connect these points and saw off this corner. Square up and plane the legs beveling off the top corners as shown. These legs are to be nailed on the corners of the shelves. Place the shelves any desired distance apart. Let the top one be two inches below the top of the leg and the lower one at least 8in. from the bottom. Sandpaper and stain or varnish when finished.

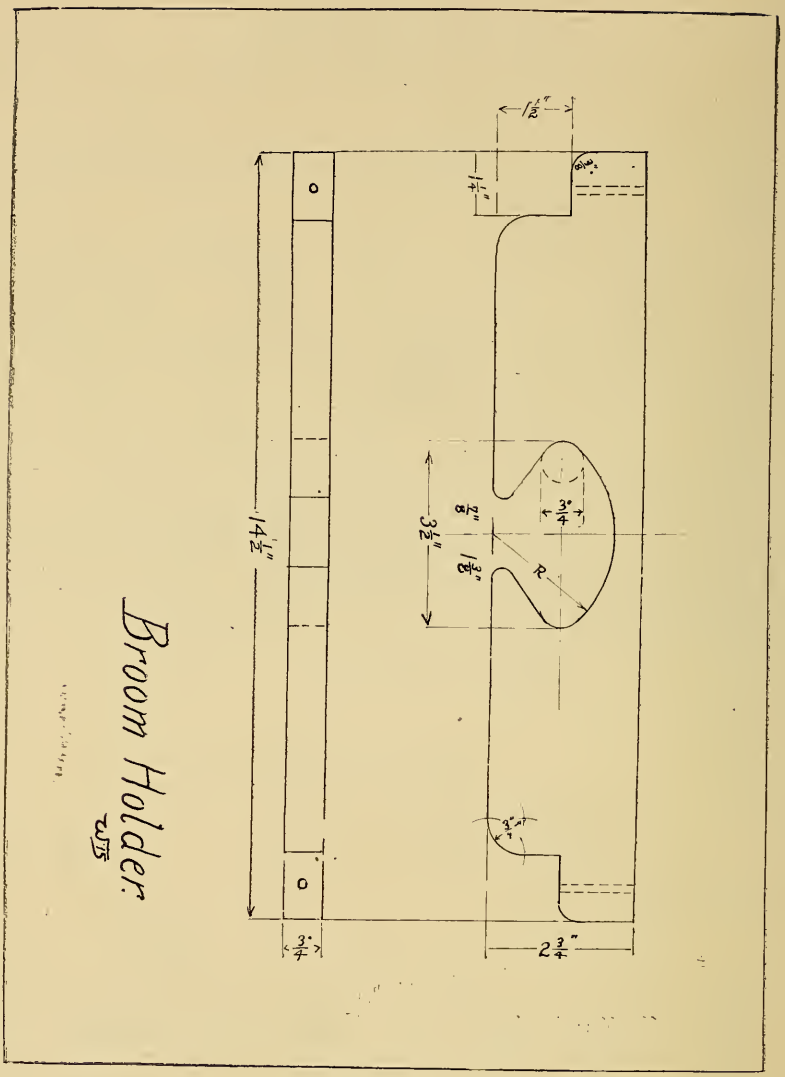


PLATE XI.

LESSON XXV.

PLATE XI. BROOM HOLDER.

MATERIAL—Board 15in. by 3in.

TOOLS—Saw, plane, brace and small bit, ¾in. bit, keyhole saw.

WORK—Saw out and plane down the stock to the exact size indicated in the drawing. Lay out the shape as shown and cut out. Dividers should be used in laying out the opening in the middle of the board. Set the points 2in. apart and draw as indicated by the radius (R). Bore holes as indicated in the drawing and saw out the opening with the keyhole saw. Saw out the corners as shown and round off with saw and plane. Bore small holes as indicated by the dotted lines for the screws. Fasten to wall or other support. The broom is placed in this holder with the brush end up.

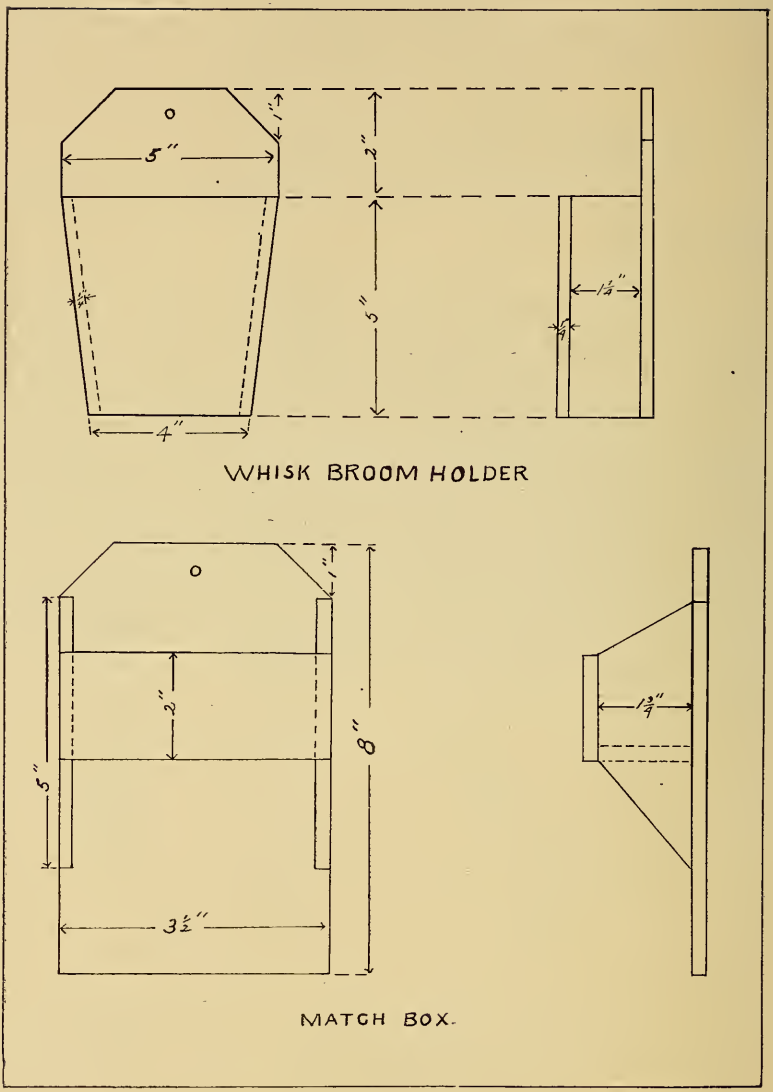


PLATE XII.

XXVI.

PLATE XII. WHISK BROOM HOLDER.

MATERIAL—Pine wood ¼in. in thickness as follows:
1 piece 7in. by 5in. for back.
2 pieces 5in. by 1¼in. for sides.
1 piece 5in. by 5in. for the front.

TOOLS—Plane, saw, brace and ⅛in. bit, try square, pencil.

WORK—Saw out and plane down the pieces to the size and shape indicated. You should by this time be able to read the working drawing without any trouble. Do the work carefully being sure each piece is correct before laying it aside. Bore the hole as shown ½in. from the top and in the middle of the board. Fasten together with ¾in. brads. Sandpaper and stain or varnish as desired.

LESSON XXVII

PLATE XII. MATCH BOX.

MATERIAL—Pine wood ¼in. in thickness as follows:
1 piece 8in. by 3½in. for the back.
2 pieces 5in. by 1¾in. for the sides.
1 piece 3½in. by 2in. for the front.
1 piece 3in. by 1¾in. for bottom.

TOOLS—Saw, plane, brace and ⅛in. bit, try square, pencil.

WORK—Saw out and plane down the pieces to the proper size.

Do not fail to look carefully at the drawing before you lay out each piece. Note that the bottom is ½in. shorter than the front piece. Why should this be? Study the side view at the right for the shape of the side pieces. Bore hole ½in. from the top in the middle of the board. Sandpaper and stain.

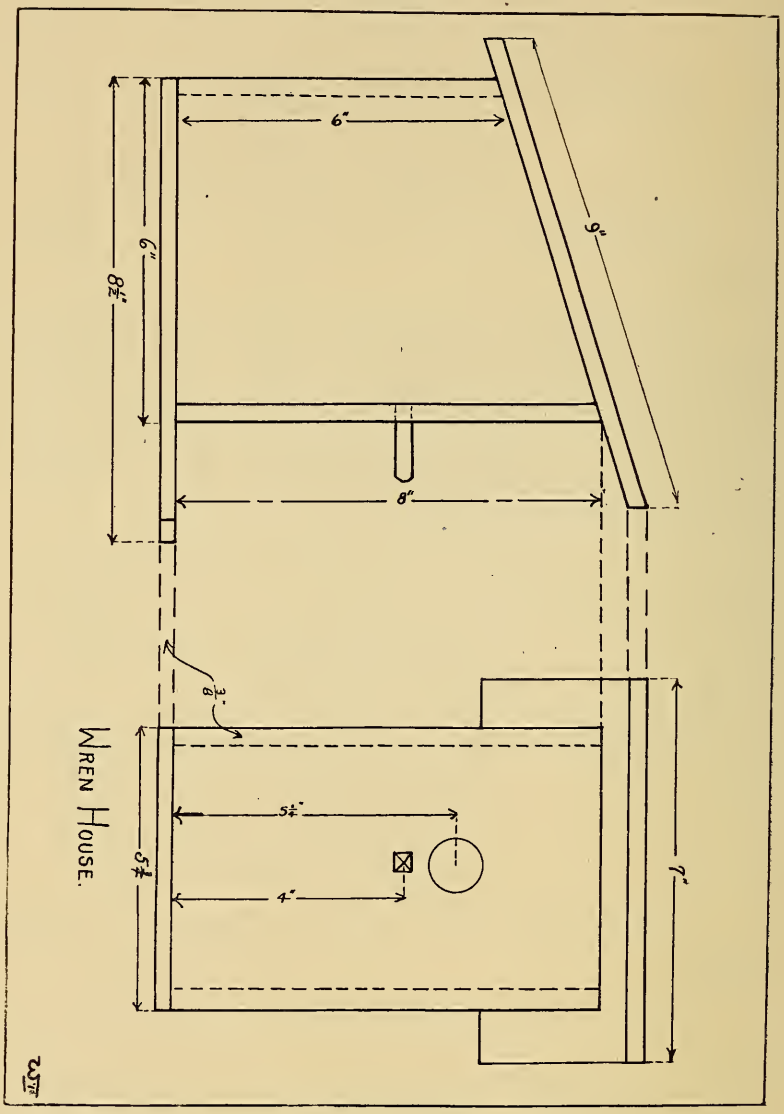


PLATE XIII.

LESSON XXVIII.

PLATE XIII. WREN HOUSE.

MATERIAL—Pine stock ½in. or ⅜in. in thickness as follows:

1 piece 7in. by 9in. for top.
1 piece 8½in. by 5¾in. for bottom.
1 piece 8in. by 5¾in. for front.
1 piece 6in. by 5¾in. for back.
2 pieces 8in. by 5¾in. for sides.

TOOLS—Saw, plane, pencil, try square, brace and 1in. bit and ¼in. bit.

WORK—This should give you no difficulty. Note that the bottom projects in front and the top projects all around. Also note how the sides are put on by being nailed to the back but having the front nailed to them. Bore the hole in front with the 1in. bit. The hole for the peg is made with the ¼in. bit. Fit the peg in tightly. Fasten together with 1in. brads.

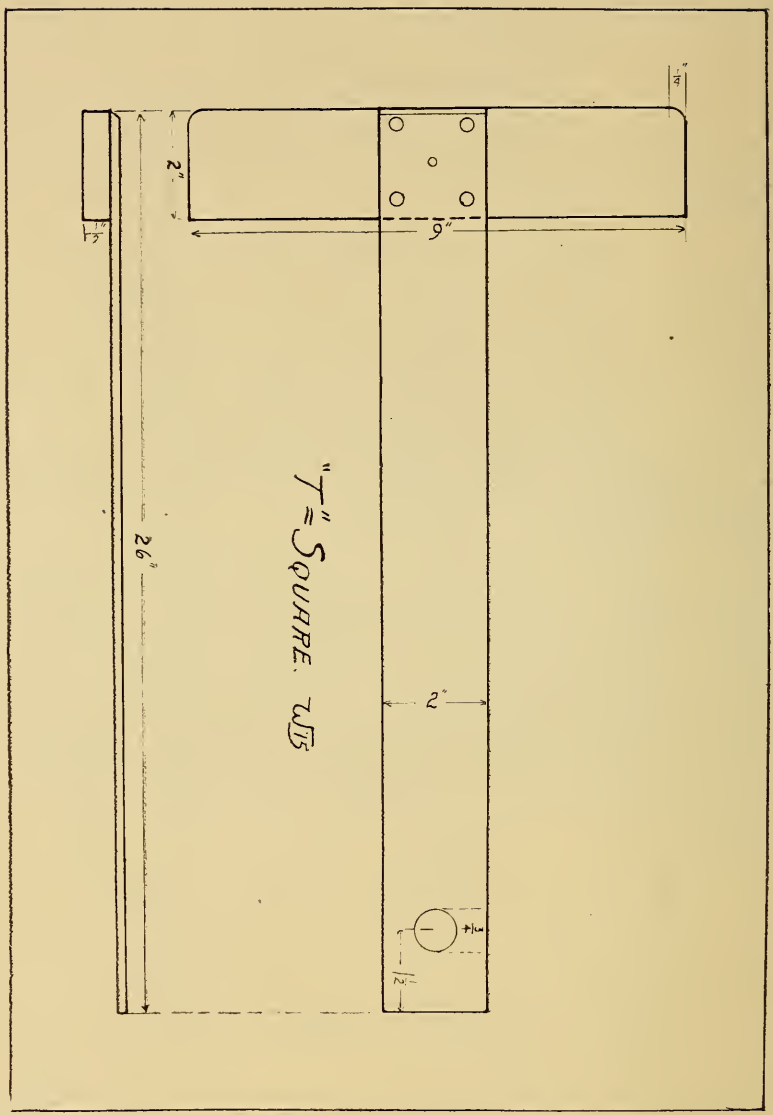


PLATE XIV.

LESSON XXIX.

PLATE XIV. "T" SQUARE.

MATERIAL—This would be better made from harder wood than pine.

1 piece 9in. by 2in. by ½in.
1 piece 26in. by 2in. and ⅛in. in thickness

TOOLS—Saw, plane, try square, pencil, screw driver, brace and ¾in. bit.

WORK—Saw pieces to proper length being careful to get ends square. Plane down to size and smooth with sandpaper. Round off the corners of cross piece as shown. Bore hole as shown in end of long piece. Fasten together with very small screws being careful to get a right angle between the two pieces. Use try square in doing this. This lesson requires most careful work although it may look simple.

LESSON XXX.

PLATE XV. BOOK RACK.

MATERIAL—Pine ⅞in. or ¾in. thick as follows.

1 piece 17in. by 5in.
2 pieces 5in. by 4½in.
4 1¾in. flat head screws.

TOOLS—Saw, plane, try square, pencil, ruler, brace and ⅛in. bit, screw driver..

WORK—Study the drawing carefully before beginning work. Only one end of the rack is shown. Saw out and plane the bottom to size, 17in. by 5½in. Bevel the edges of the top of this board as is shown in the drawing. Saw out the end supports in the shape and size indicated. Sandpaper all well. Bore holes for the screws placing two in each support. These holes should be bored 1in. from the end of the base board. Stain when finished. This rack is placed on a table or desk. The ends support the books in an upright position.

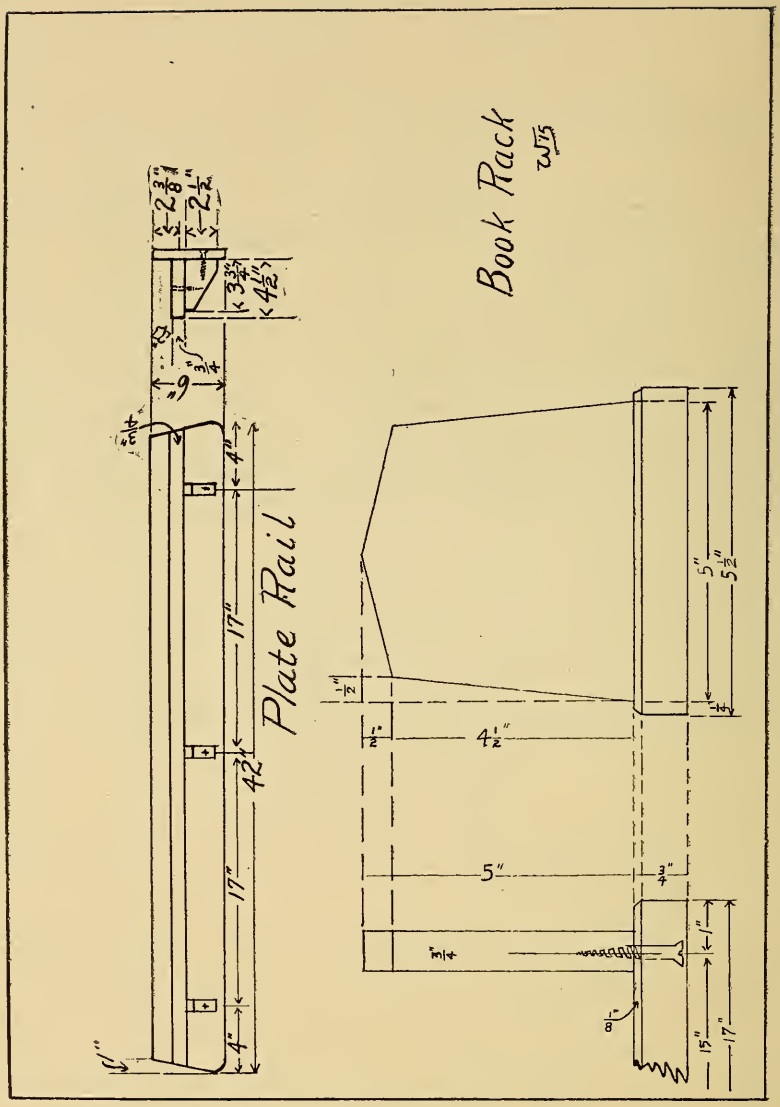

Book Rack
Plate Rail
2 3/8"
2 1/2"
3 3/4"
4 1/2"
9"
3/4"
1/4"
4"
17"
42"
17"
4"
1"
1/2"
1"
4 1/2"
5"
5 1/2"
1/2"
5"
3/4"
3/4"
1"
1/8"
15"
17"

PLATE XV.

LESSON XXXI.

PLATE XV. PLATE RAIL.

MATERIAL—May be made of pine or other wood, ¾in. or ⅞in. thick.

1 piece 42in. by 6in. for the back.
1 piece 42in. by 4½in. for the shelf.
3 pieces 3⅜in. by 2½in. for the brackets.
6 flat head screws 1½in. in length.

TOOLS—Saw, plane, ruler, try square, pencil, screw driver, brace and ⅛in. bit.

WORK—Study the drawing before beginning work so you will have a good idea of the plan of the pieces. Saw out and plane the back and the shelf to the size given. Cut the ends of the back in the shape shown. Place the shelf against the back in the proper place and mark at the ends to get the right length to cut the shelf. Saw off shelf at the places marked. Saw out brackets of the shape shown. Be sure to have the end of the bracket that is to go against the back square. Look at the drawing and measure and mark the location of the brackets on the back and shelf. Bore holes for screws in the proper places. Fasten together with the screws. See that all joints are tight. Sandpaper and stain. Fasten to wall with screws.

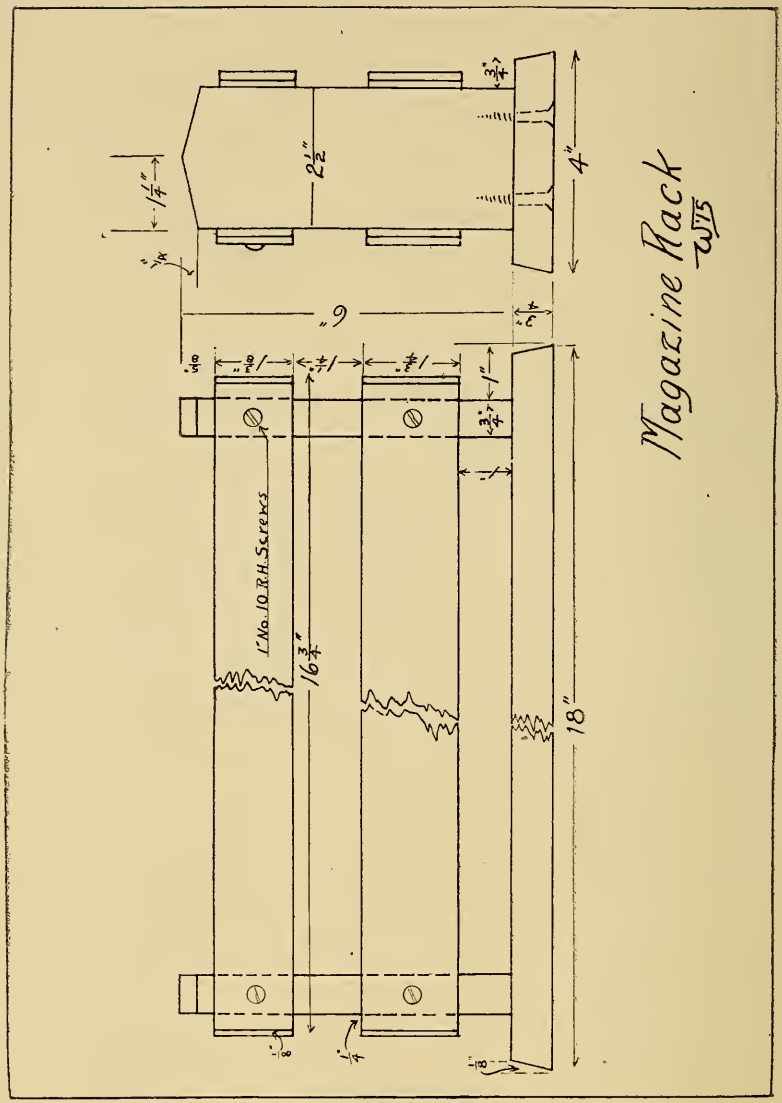


PLATE XVI.

LESSON XXXII.

PLATE XVI. MAGAZINE RACK.

MATERIAL—Pine ¾in. or ⅞in. thick as follows:

1 piece 18in. by 4in. for the base.

2 pieces 6in. by 2½in. for ends.

4 pieces 16¾in. by 1¾in. and ¼in. thick for the side rails.

4 flat head screws 1½in. in length, 8 round head screws 1in. in length.

TOOLS—Saw, plane, screw driver, try square, pencil, ruler, brace and ⅛in. bit.

WORK—Saw out the base and plane to size given. Note that it is not planed square but is given a slant or bevel all around. Saw out the ends to the shape given. So far this problem is much like the Book Rack in lesson XXVIII. Next plane and saw out the side pieces to the proper size. Note that the outside corners of these are beveled off a little with the plane. Fasten the ends to the base with the flat head screws and use the round head screws to fasten on the sides. Make your measurements exact. Sandpaper and stain.

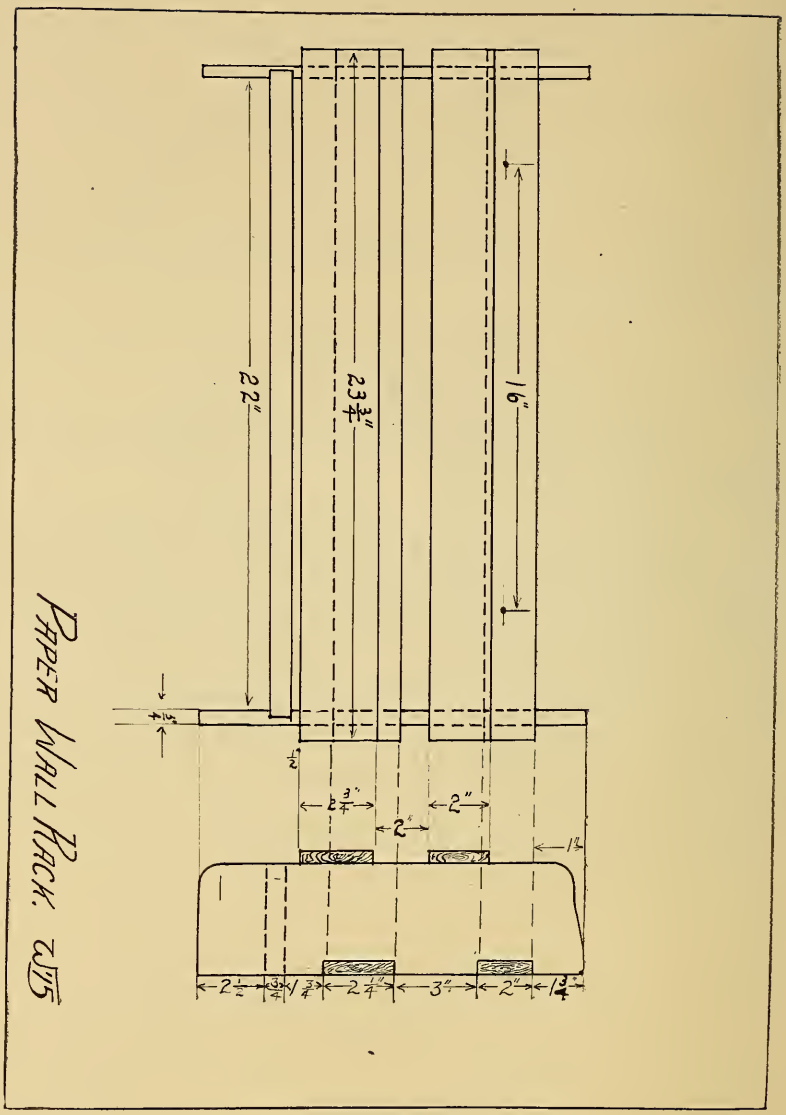


PLATE XVII.

LESSON XXXIII.

PLATE XVII. WALL RACK FOR PAPERS OR MAGAZINES.

MATERIAL—Pine wood as follows:

1 piece 22in. by 4in. by ¾in. for bottom.
2 pieces 13in. by 4in. by ¾in. for ends.
4 pieces of ½in. stock 3in. by 24in. for rails in front and rear.

TOOLS—Saw, plane, brace and ⅛in. bit, try square, ruler, pencil, screw driver and ¾in. chisel.

WORK—Saw out and shape the ends. Study the drawing for this. The shape may be changed somewhat, if desired. Note that the back rails are let into the end pieces. Mark out these cuts, saw across in both places and cut out with the chisel. Be sure you do not make these cuts too deep. Note too that the two back rails are not of the same size. Cut out and plane the bottom piece. Note that this is also let into the end pieces. Lay out and cut this mortise in each of the end pieces. Do this work carefully so as to get a good fitting joint. Nail the end pieces to the bottom with 2in. finishing nails. Place the back rails in position and nail with 1½in. brads. Sandpaper and stain.

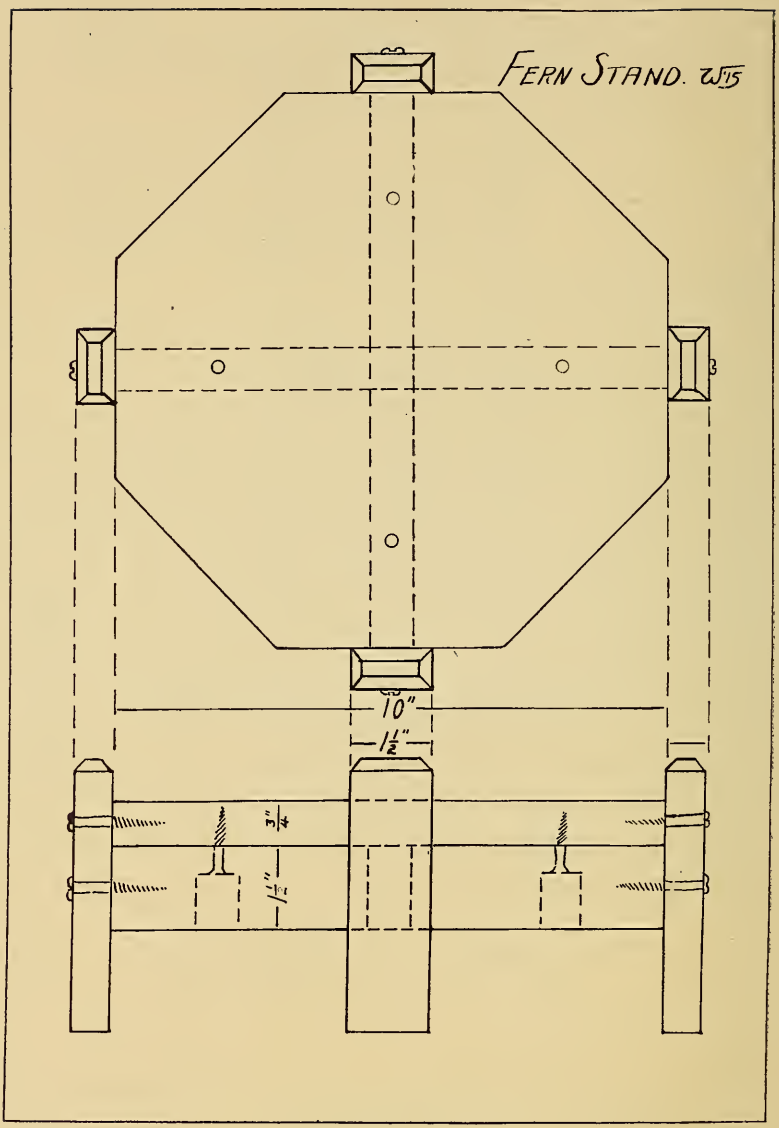


PLATE XVIII.

LESSON XXXIV.

PLATE XVIII. FERN STAND.

MATERIAL—This would be better made from hard wood but may be made of pine.

1 piece 10in. by 10in. by ¾in. for the top.

2 pieces 10in. by 1½in. by ¾in. for supports of top.

4 pieces 7in. by 1½in. by 1in. for the legs.

TOOLS—Saw, plane, try square, ¾in. chisel, ruler, pencil, screw driver, brace and ½in. bit.

WORK—Again you have use for the method of laying out an octagon learned in lesson XVIII. Lay out and saw out the top of the stand. Lay out the legs. These may be made of a different length from that given above, if desired. Note that the tops of the legs are beveled on all four sides Make the supports of the exact size required. On these you have a new problem called a Half Lap joint. To make it proceed as follows. Measure in from each end of the supports on the narrow edge exactly 4⅝in. This is presuming your supports to be ¾in. thick. With the try square make cross marks here. Try the supports between these lines to see if they fit. When you are sure they are right saw down on these marks just half way through the supports. Cut out the mortise with the chisel. Do the same on both supports Fit them together in these mortises. You should have a good joint and the two supports should fit together no thicker than one of them would be. You are now ready to put the stand together. Study the drawing for the location of the screws. You will need 8 round head screws 1¾in. long and 4 flat head ones 1¼in. in length. Bore into the supports on the under side as shown for the screws that hold the top in place. The legs should project above the top about 1in. Sandpaper until smooth and stain.

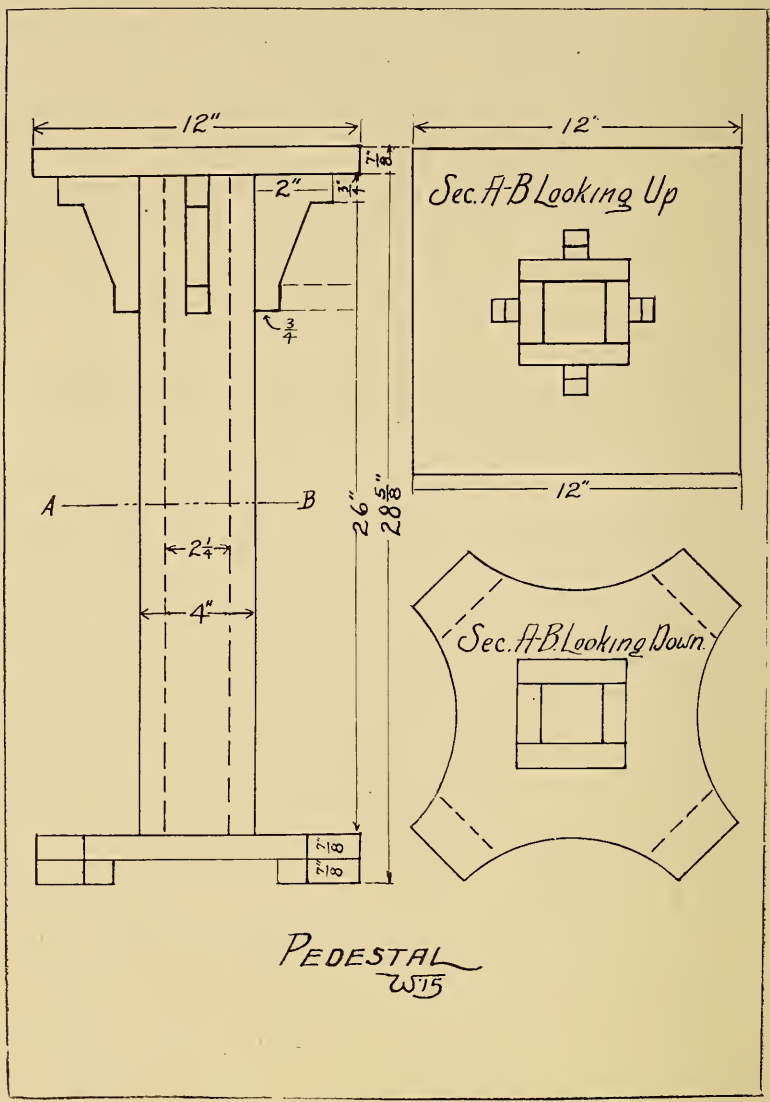

12"
12"
2"
Sec. A-B Looking Up
A
B
26"
28⅝"
2¼
4"
12"
Sec. A-B Looking Down.
PEDESTAL
W15

PLATE XIX.

LESSON XXXV.

PLATE XIX. PEDESTAL.

MATERIAL—This may be made of any kind of wood. It should be made of stock not less than 7/8in. in thickness.

2 pieces 26in. by 2¼in.
2 pieces 26in. by 4in.
2 pieces 12in. by 12in. for top and base.
4 pieces 2in. by 4in. for brackets.
4 pieces 3in. by 1½in.

TOOLS—Saw, plane, try square, ruler, compass, pencil, compass saw.

WORK—Plane the long pieces to the size given and saw off square at each end. Nail them together as shown in the drawing on the right. This makes the upright. Saw out the brackets. The shape of these may be varied if desired. With the compass draw the arcs shown on the base. Saw out with the compass saw. Saw off the corners as shown. The small blocks should be sawed to fit under each corner as shown. Fasten together with finishing nails or screws. Stain.

SUGGESTED ADDITIONAL MODELS TO MAKE.

Tooth Brush Holder	Harness Hanger
Neck Tie Rack	Seed Corn Hanger
Picture Frame	Ironing Board
Key Rack	Bread Board
Foot Stool	Book Case
Bracket Shelf	Tool Chest
Meat Board	Knife and Fork Box
Towel Roller	Comb Case
Ink Bottle and Pen Holder	Salt Box
Seed Corn Tester	Coat Hanger

Pupils interested in wood stains, write to S. C. Johnson & Son, Racine, Wisconsin, and ask for samples of wood showing different colors of stain.

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